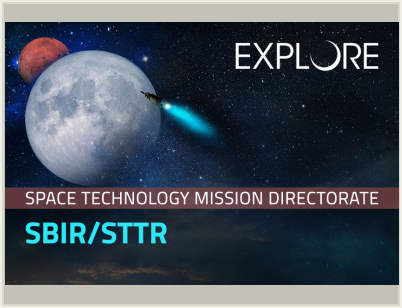
Hypergol Sensor Using Passive Wireless SAW Devices, Phase I

Completed Technology Project (2011 - 2012)

Project Introduction

This proposal describes the preliminary development of surface acoustic wave (SAW) based hypergolic fuel sensors for NASA application to distributed wireless leak detection systems. SAW devices are a platform technology for passive wireless sensing of numerous possible measurands. ASR&D and its collaborators have demonstrated passive wireless sensors using SAW devices, for applications including temperature sensing, cryogenic liquid level sensing, hydrogen sensors, and humidity sensors under NASA SBIR and STTR funding. The proposed hypergolic fuel sensors will use SAW devices combined with chemically selective film elements to explore the possibility of producing sensitive hydrazine (HZ, MMH, and DMH), and nitrogen tetroxide sensors capable of detecting low ppb concentrations over a range of ambient conditions. This research will utilize the results obtained in ASR&D's nanocluster Palladium (Pd) film and coded SAW sensor and wireless interrogation system research, and existing hypergol sensing technologies. The proposed films should experience large conductivity changes due to interactions with the hypergolic chemicals being detected, producing measurable changes in SAW device performance, as seen in ASR&D's hydrogen sensors. During the Phase I project, issues including formation of the chemically selective films on piezoelectric substrates, optimization of these films, and sensor performance for different device types will be investigated. Successful completion of the proposed Phase I activities will establish the technical feasibility of producing the proposed sensors, evaluate the potential performance capabilities of optimized sensors, and define the additional work necessary to effect device implementation. Assuming the results of Phase I are positive, Phase II could result in development of multiple uniquely identifiable, wirelessly interrogable hydrazine and nitrogen tetroxide sensors.



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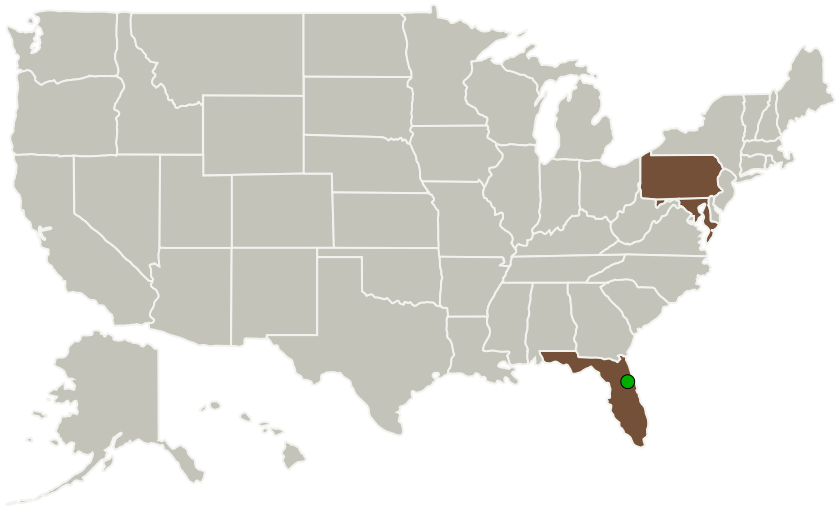
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
SenSanna Incorporated (formerly Applied Sensor Research & Development)	Lead Organization	Industry Women-Owned Small Business (WOSB), Veteran-Owned Small Business (VOSB)	Arnold, Maryland
Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida
Temple University	Supporting Organization	Academia	Philadelphia, Pennsylvania

Primary U.S. Work Locations	
Florida	Maryland
Pennsylvania	

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

SenSanna Incorporated (formerly Applied Sensor Research & Development)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jacqueline H

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Project Transitions

February 2011: Project Start

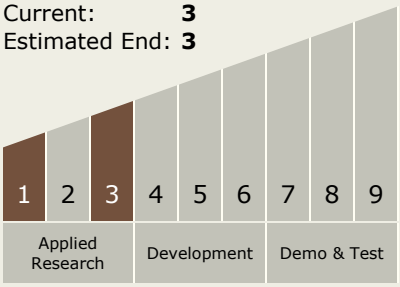
February 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138620)*

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  - TX13.2 Test and Qualification
    - TX13.2.7 Test Instruments and Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System